GLUCAGON STIMULATION TEST – PAEDIATRIC PROTOCOL

INTRODUCTION

This test is used in the assessment of growth hormone (GH) and ACTH / cortisol reserve, especially when insulin-induced hypoglycaemia is contraindicated e.g. history of convulsions, hypoglycaemia or diabetes mellitus. Glucagon works by stimulating the release of GH and ACTH by a hypothalamic mechanism, indirectly stimulating cortisol secretion. GH response to glucagon is slow so the late samples are important.

CONTRAINDICATIONS AND SIDE EFFECTS

- Phaeochromocytoma or insulinoma (may provoke an attack)
- Starvation of >48 hours or glycogen storage disease (may result in hypoglycaemia)
- Severe hypocortisolaemia (09.00h cortisol <55 nmol/L)
- Thyroxine deficiency (may reduce GH and cortisol response)

Nausea is a common side-effect (30%) and, rarely, patients may vomit.

PATIENT PREPARATION

The child should have fasted overnight (from 10.00pm) with only water to drink. The test is performed in the morning.

Baseline Tests

Thyroid function (TSH and free T4) and cortisol levels **must** have been checked prior to undertaking this test to rule-out panhypopituitarism.

Concurrent medication

GH should be stopped for at least 2 weeks prior to the test. If on hydrocortisone, omit dose on the morning of the test. Recommence usual medication after the test.

Sex Steroid priming

In children over 11 years of age or with a bone age of greater than 10 years Stilbestrol should be given (1.0mg b.d.) for 48 hours prior to the test. If necessary, the GH provocation test may need to be re-booked and Primoteston (125mg i.m.) given 5 days before the test.

PRECAUTIONS AND PATIENT CARE DURING TEST

Children can become hypoglycaemic after glucagon, usually at 90 – 120 minutes.

1. Check glucose levels (by meter) at the time of every sample
2. Check that the child is responsive at every sample if they fall asleep. If not responsive follow instructions for emergency management of hypoglycaemia below.
3. A sweet drink and a full meal **must** be eaten and tolerated after the test and the child should be observed for 1 hour after the test.
4. Blood glucose (by meter) **must** be greater than 4 mmol/L before discharge.

Emergency Management of Hypoglycaemia

1. Give glucose intravenously 200mg/kg (10% dextrose, 2mL/kg) over 3 minutes
2. Continue with glucose infusion intravenously at a rate of 10mg/kg/min.
3. Measure blood glucose after 4-5 minutes (using meter) and adjust glucose infusion to maintain blood glucose level at 5 to 8 mmol/L and no higher.
4. Do not give glucagon unless venous access is lost.
5. Give 100mg hydrocortisone intravenously if hypopituitarism is suspected.
6. If there is no improvement in the state of consciousness after normal blood glucose levels are restored then an alternative explanation must be sought.

PROTOCOL

Please use separate pro-forma to record samples taken and timing.

1. The child should rest in bed during the test.
2. If necessary, apply Ametop cream to a suitable cannulation site and wait for at least 45 minutes before cannulation
3. Cannulate the child and wait 30 minutes before taking baseline (time 0) samples (see pro-forma).
4. Check glucose level (by meter).
   - If glucose level is less than 2.6 mmol/L **then do not administer glucagon.** Continue and sample as per pro-forma but only for 90 minutes. Hypoglycaemia should only be corrected if required as described above.
   - If glucose level is greater than (or equal to) 2.6 mmol/L then administer glucagon i.m. Dose: 15mcg/kg body weight (maximum dose 500mcg).
5. Continue to take samples as per pro-forma (60, 90, 120, 150 and 180 minutes).
6. Observe for signs of hypoglycaemia throughout test and record in patient's notes.
7. Remember to check child's glucose level (by meter) and responsiveness at every sample.

INTERPRETATION

Adequate GH response is defined as levels above 8.3 ug/L (20 mU/L). Peak GH levels below 4.2 ug/L (10 mU/L) are suggestive of GH deficiency, with levels between 4.2 and 8.3 ug/L suggestive of partial growth hormone deficiency.

Adequate cortisol response is defined as a rise of greater than 170 nmol/L to above 450 nmol/L.

CONTACTS

Biochemistry	Biochemist	x 3025 / 3038 / 3029
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REFERENCES

1. Maidstone District General Hospital Protocol
2. Royal London Hospital Protocol